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Can Variation in Public Policies Account for Differences in Comparative Advantage?

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ABSTRACT

This article seeks light on the main claim of the *Varieties of Capitalism* (VoC) framework that public policies can help to shape comparative advantage, and, to complement existing assessments that have relied predominantly on qualitative data from a few economic sectors. It examines the distribution of export success in a number of economic sectors, in which competitiveness is characterized by either radical or incremental innovation. Unlike previous studies, it does this across all those OECD countries clearly identified in the VoC literature as either liberal market economies, co-ordinated market economies or unclassified. Moreover, it draws on the latest available data at the lowest level of aggregation. In contrast to previous studies, a more appropriate measure of trade specialization, revealed symmetric comparative advantage, is used. Overall, the evidence supports the VoC framework; however, in some sectors, the data raise important conceptual and methodological issues overlooked in current research.

In recent years there has been heightened interest into the effects of increased global competition (product-market de-regulation, technological advances, enhanced capital mobility, and the spread of the market system) on national public policies (Berger and Dore, 1996; Hall and Soskice, 2001a; Hollingsworth and Boyer, 1997; Lütz, 2004; Whitley, 1999).[1] The mainstream view is that public-policy frameworks that hinder the freedom of companies to adjust their strategies – for example, in terms of output or employment – will have to de-regulate their economies (Esping-Andersen and Regini, 2000; Scharpf and Schmidt, 2000), so that firms operating there can compete more effectively. The

view that de-regulated economies perform better than those that hamper managers' prerogatives is especially prevalent in the public debate (Economist, 1999). Such a view obviously assumes that there is one best way for countries – via the companies that operate in them – to achieve economic success. An important exception to this view is the recent volume on the *Varieties of Capitalism* (VoC) edited by Hall and Soskice (2001a; see also Hall 2001). It argued, in part at least, that 'non-market' public policies, such as regulated labour markets, might offer distinct benefits to companies.

The main and innovative claim of the VoC framework is that different types of national institutional settings, which are categorized as either liberal market economies (LMEs) or co-ordinated market economies (CMEs) or unclassified by Hall and Soskice (2001b: 19–21), will favour contrasting innovation strategies either radical or incremental. These different innovation strategies are, in turn, likely to lead to success in different product markets. Indeed, as the subtitle of the volume makes clear, Hall and Soskice contend that national economic institutions – which include public and para-public policies – lay the foundations for comparative advantage. They argue, therefore, that these institutional differences will result in 'cross-national patterns of [product] specialization' Hall and Soskice (2001b: 38). (See also Casper and Whitley, 2004; Hall, 2001; Soskice, 1999; *cf.* Bartle, 2002.) From that main claim, two broad expectations can be drawn. Firstly, LMEs, compared to CMEs, will tend to have a higher number of sub-sectors in which they have a comparative advantage in sectors characterized by radical innovation, and, secondly, that CMEs should outperform LMEs in sectors characterized by incremental innovation.

Despite many empirical analyses within the *Varieties of Capitalism* volume and despite other studies that have attempted to assess the paradigm (Casper and Matraves, 2003; Casper and Whitley, 2004; Hall and Gingerich, 2001; Paunescu and Schneider, 2004; Soskice, 1999), the measure of trade specialization used in this paper, revealed symmetric comparative advantage (RSCA), has tended to be overlooked, even though it is a more appropriate measure of comparative advantage than those used by other researchers. Where it has been used before (Fioretos, 2001), the data underpinning it come from 1990. Building on the work by Fioretos (2001), this paper will classify economic sub-sectors according to whether they are characterized by incremental or radical innovation. It will then examine the distribution of sub-sectors within broader economic sectors in which all OECD countries identified as either LMEs, CME or unclassified (Hall and Soskice, 2001b: 19–21) have a comparative advantage.

This paper, therefore, will update some analyses within the VoC framework by drawing upon more recent data. Unlike previous studies it

will provide comprehensive coverage of both the economic sectors and the countries to which the VoC paradigm applies. Moreover, the analysis will rely on data at the lowest possible level of data aggregation of the standard international trade classification (SITC) system (revision 3). By adopting a quantitative approach, this paper aims to complement assessments of the VoC paradigm carried out at the sectoral level that rely predominantly on qualitative data (Casper and Matraves, 2003; Casper and Whitley, 2004). This paper will also outline how many of the arguments in the VoC literature are based on the concept of *necessity* and not *sufficiency*. This has important ramifications for the type of analytical techniques used and the interpretation of the evidence.

The next section outlines the VoC approach and discusses the concept of necessity, and the way it applies to the VoC framework. Previous studies in this area are then outlined. A section on data and methodology used in this paper will, *inter alia*, outline why revealed symmetric comparative advantage (RSCA) is a more appropriate measure than that used by Soskice (1999) in a similar analysis. It will be followed by an examination of the distribution of sub-sectors in which CMEs, LMEs and 'unclassifieds' have a comparative advantage. The sub-sectors form part of seven, broader economic sectors that are characterized by either incremental or radical innovation. Finally, the broader ramifications of the findings of this paper for the VoC approach are discussed.

The importance of public policies in the varieties of capitalism framework

The VoC framework focuses on many important areas of public policy and para-public policy. The former can include the industrial-relations, and corporate-governance systems; the latter inter-firm relations, and vocational training systems. It will not be possible to go into the details of these different areas here. However, an overview of the main arguments espoused in the VoC paradigm as well as the ways in which different (para-)public policies interlink within these broad arguments will be provided. In short, the VoC approach has two key stages. In the first, it is argued that different national economic institutions offer distinct opportunities to companies. As companies are likely to be aware of these opportunities, they will, on the whole, adjust their production strategies as well as their use of, for example, different types of human capital (either general or firm specific) to take advantages of these opportunities. It is argued that these institutions and, hence, opportunities differ between countries or at least between groups of countries. Hall and Soskice (2001b) distinguish between CMEs, such as Germany and Sweden, and LMEs, such as the USA and the UK.

In the former group of countries, labour-market institutions, such as works councils and industry-wide collective agreements, can promote the provision of firm-specific skills (Hall and Soskice, 2001b: 24–25); this is also supported by the fact that many companies in these countries are financed by bank-based, and not equity, capital. This is said to facilitate a long-term outlook amongst companies (Casper and Matraves, 2003: 1870). In the latter group of countries, by contrast, companies do not have to liaise with worker representatives; they are also freer to hire and fire workers as they please: 'top management normally has unilateral control over the firm' (Hall and Soskice, 2001b: 29). This will discourage firms from pursuing 'production strategies based on promises of long-term employment' (Hall and Soskice, 2001b: 30, see also 33). Such a strategy is also said to be discouraged by a financial system in which stock markets play a very prominent role. It is argued that financial markets place pressure on firms to post good financial results quarter after quarter (*cf.* Gospel and Pendleton, 2004).

In the second key stage in the VoC framework, this reliance on, for example, different forms of human capital can help to facilitate success in certain product markets. Workers with firm-specific skills will be a prerequisite for, though not a guarantee of (Streeck, 1992), success in product markets characterized by incremental innovation, which are said to be 'marked by continuous small-scale improvements to existing product lines and production processes' (Hall and Soskice, 2001b: 39). Workers with general skills, on the other hand, will be a *sine qua non* in markets in which radical innovation – 'innovative design and rapid product development based on research' (Hall and Soskice, 2001b: 39) – is the key to success. For instance, Soskice (1999: 113) has argued that products from firms in CMEs will 'depend on skilled and experienced employees on whom responsibility can be devolved. By contrast, the United Kingdom and the United States have not been successful in these areas'. In short, national economic frameworks lay the foundations for comparative advantage (Hall and Soskice, 2001b: 41; see also Casper, 2000; *cf.* Whitley, 1999). This differing success in various product markets will be reflected in comparative advantage or related data. Hall and Soskice (2001b: 37–38, 41) and Soskice (1999) have, indeed, used such data to bolster their arguments (see below).

Are certain public policies necessary *for success in some product markets?*

In many of their arguments, Hall and Soskice (2001b) either explicitly or implicitly argue that, in order to overcome the problems associated with a strategy of incremental innovation (opportunism by autonomous workers as well as by managers who have the potential to be exploitative),

it is *necessary* to have (para-)public policies similar to those found in CMEs, paradigmatic examples of which are Germany and Sweden (Thelen, 1993; Katzenstein, 1989; Pontusson and Swenson, 1996). A *necessary* cause, as Ragin (2000: 91) has noted, is one that 'must be present for the outcome in question to occur'. Its presence does not, however, automatically lead to the outcome. If a factor, in Ragin's words (2000: 92), 'always [produces] the outcome in question', it is viewed as a *sufficient* cause. For arguments similar to those of Ragin, see Braumoeller and Goertz (2000) and Dion (1998).

Within the VoC approach, it is not argued that CME-type institutions will always lead to production strategies based on incremental innovation. (For a more in-depth look at the assumptions underpinning the VoC approach, see Allen, 2004.) For instance, Soskice (1999: 115, emphasis added) has argued that 'efficiency [when pursuing a strategy of incremental innovation] *requires* a more consensus-based approach to decision making.' He does not argue that a consensus-based approach to decision making is *sufficient* to lead to efficiency in this area. In a similar vein, Soskice (1999: 115, emphasis in the original) has also spoken of the 'need', or necessity, of having '*skilled employees* with industry-technology skills as well as company-specific product knowledge skills', if companies are to pursue a product strategy of incremental innovation successfully.

The fact that the concept of necessity lies behind many of the arguments within the VoC approach that relate to public policies has ramifications for the statistical technique used to assess such arguments. Many conventional statistical techniques, such as multivariate regressions, conflate the concepts of *sufficiency* and *necessity* (Ragin, 2000: 96). The nature of the arguments within the VoC framework, therefore, militates against their use. This paper, building on previous quantitative analyses of the VoC approach (see below), will, therefore, examine the number of sub-sectors in which all of the OECD countries identified within the VoC literature as either LMEs, CMEs or unclassified have a comparative advantage in economic areas that are characterized by incremental or radical innovation. This means that a far greater number of countries will be included in the analysis than has previously been the case. It should, of course, be noted that, given the nature of the VoC arguments, there is unlikely to be a clear dichotomy (or trichotomy) between CMEs and LMEs (and unclassifieds), and the sub-sectors in which they have a comparative advantage.

Quantitative empirical tests of the VoC paradigm

The measure used in Hall and Soskice (2001b) to bolster their arguments is patent data. Within this data, they classify (although it is not made clear

how) different industries into either incremental or radical innovators. Examples, according to Hall and Soskice (2001b), of sectors characterized by incremental innovation are mechanical engineering, product handling, transport, consumer durables, and machine tools. Germany, they argue, is strong in these sectors. Hall and Soskice (2001b: 41–44) juxtapose these German strengths next to relative American weakness. The US is, however, seen as being strong in sectors that are characterized by radical innovation. It is in these sectors, such as medical engineering, and biotechnology, that Germany is seen as being weak. It should, however, be noted that patent data are an inappropriate measure of comparative advantage, as patents might only 'translate' very poorly into comparative advantage. For example, the fax machine, though patented in Europe, proved to be a great commercial success for many Japanese companies (Schröder, 2002).

Researchers who have propounded the VoC approach have not just relied on patent data, however. They have also tried to bolster their arguments with comparative empirical evidence on export success in different industrial sectors. For instance, adducing data from Michael Porter (1990), Soskice (1999: 113) notes that, in 1985, Germany had 46 (unnamed) industries in the (undefined) 'machine industry' sectors of the economy that were 'internationally competitive'. Soskice, relying on Porter's work (which drew, as this paper does, on data at the five-digit classification level), defined 'internationally competitive' in an unsatisfactory way (see below) to mean that, in those 46 industries, the export share was larger than Germany's aggregate export share. In the 'machine industry' sectors of the economy, Soskice (1999: 113) noted that the UK had just 18 industries that were internationally competitive. The contrast with Germany is, therefore, stark.

Soskice's analysis does not stop there. He goes on to note that the UK, a good example of an LME (King and Wood, 1999), has a strong export record in 'service industries', whilst Germany fares relatively badly. Soskice (1999: 114) notes that in these industries, Germany had seven sectors that were internationally competitive, whereas the UK had 27, and the US 44. Soskice argues that these industries rely on the individual skills of highly trained and mobile professionals. They include, amongst other things, management consultancy, advertising and related media services, and investment banking. These data would, therefore, appear to support Hall and Soskice's arguments (2001b: 38) that there are 'cross-national patterns of specialization'. This is especially true given the fact that Soskice (1999) also includes data for Switzerland, Sweden, and Italy in his analysis. However, to support their claims, Hall and Soskice (2001b) surely have to show that the data for a broader range of countries – ideally, for all countries that they classify as either LMEs or CMEs (Hall

and Soskice, 2001b: 19–21) – are consistent with their contentions. This paper attempts to do that by providing data on all those OECD countries assigned to one of three groups in the VoC framework.

Moreover, despite providing some examples of economic sectors that can be said to be characterized by either incremental or radical innovation, Soskice's (1999) categorization is relatively limited, and, hence, is an inadequate basis upon which to found a detailed cross-national assessment of trade specialization. A much more rigorous and extensive classification of economic sectors has been utilized within the VoC literature by Fioretos (2001: 222). This latter classification was devised by the OECD to assign different economic sectors to one of five categories. The two categories that are of interest here are the 'specialized supplier' and 'science-based' ones, as they conform closely to industries characterized by incremental and radical innovation respectively.[2] (The other three categories are 'resource intensive', 'labour intensive' and 'scale intensive'.) The benefits of using this classification are twofold. Firstly, it enables the research undertaken here to be replicated. Secondly, and most importantly, it enables comprehensive data to be drawn upon that are not only available for all OECD countries, but that are also available at a very low level of aggregation. This is especially relevant given the fact that the VoC applies to the competitiveness of firms within specific industries (Hall and Soskice, 2001b).

Data and methodology

The data used in this article are drawn from the OECD's database on international trade by commodities statistics (revision 3). Data at the lowest possible level of aggregation are used; this is usually the five-digit level, but, where this level does not exist, the four-digit level has been drawn upon. Data for 2002 are used as they are the latest year for which export data are available for all 32 OECD member states and territories. (Hong Kong and Taipei are considered here as separate entities to the People's Republic of China.) The reported comparative advantages and disadvantages are for those countries clearly identified in the VoC literature as either CMEs, LMEs or unclassified.

Comparative advantages and disadvantages are based on the measure of revealed symmetric comparative advantage (RSCA), which, in turn, builds upon Balassa's (1965) index of revealed comparative advantage. The revealed comparative advantage (RCA) of sector j in country i is calculated as follows:

$$\mathrm{RCA} = \frac{(\text{country i exports in sector j/total exports from country i})}{(\text{OECD exports in sector j/total OECD exports})}$$

The numerator in the above term represents the ratio between a country's exports in a given sector and the country's total exports; this ratio is then compared to the ratio for the same sector for the OECD as a whole (including country i's exports). If the RCA equals 1 for a sector, the country's exports in that sector as a share of the country's total exports is the same as the 'average' for that sector for the OECD as a whole. When the RCA is greater than 1, the country under consideration has a revealed comparative advantage in that sector. When the RCA is less than 1, the country has a revealed comparative disadvantage in that sector. The RCA could take any value between 0 and infinity, and, thus, is difficult to use in cross-country comparisons. In order to overcome this problem, Laursen (1998) has suggested transforming the RCA as follows:

$$\text{RSCA} = (\text{RCA} - 1)/(\text{RCA} + 1)$$

This makes the index symmetrical about zero: values above zero indicate a comparative advantage, figures below zero indicate a comparative disadvantage. It can range from -1 to 1.

The RSCA index is a more appropriate measure to use than that employed by Soskice (1999, 113), as the RSCA takes the 'tradability' of different goods into account. Soskice's measure of 'international competitiveness' does not compare export success *across* nations, but *within* them. It is calculated as follows:

$$\text{'International competitiveness'} = \frac{(\text{country i exports in sector j}/\text{total production in sector j in country i})}{\text{aggregate export share for country i}}$$

If the export ratio for one sector is higher than the aggregate export share for the entire economy, then, on Soskice's measure, that sector is internationally competitive. However, as Soskice does not compare one country's export success to that of other countries, he has no way of knowing whether or not he is merely assessing the ease with which that product can be exported. It could, for example, be the case that one particular product has an above-average export record in one country. For Soskice this would be evidence of product specialization. If this product has an above-average export record in other countries, all these countries would, on Soskice's measure, be specialized in the trade of that commodity. Yet the concept of 'comparative advantage' surely requires a measure that *compares* export success *between* countries and not just *within* them. The RSCA outlined above does just that.

Success in sectors characterized by incremental innovation

The next two sections set out the comparative advantages of the various OECD countries in sectors characterized by incremental and radical innovation. They are followed by an in-depth discussion of the data. Table 1 shows the number of sub-sectors, within the three broader economic sectors characterized by incremental innovation, in which the countries have a comparative advantage. The Table also ranks the countries. All of the rankings are based solely on the absolute number of sub-sectors in which the countries have a comparative advantage. They do not take into consideration the values of the actual exports or the magnitude of the RSCA scores. So, for instance, in the 'non-electrical machinery' sector, Germany has a comparative advantage in the most sub-sectors (258). It is, therefore, ranked first. In situations in which two or more countries have the same number of sub-sectors with a comparative advantage, they are ranked in equal place.

In the sectors shown in Table 1, CMEs should tend to do well, whereas LMEs should perform less well, if the VoC framework is correct. The data within the 'non-electrical machinery' sectors (columns i and ii of Table 1) offer support to the VoC framework. Of those countries ranked in the top five in this sector (column i), four are, as expected by the theory, CMEs (Germany, Japan, Switzerland and Austria); the fifth (Italy) is not classified in the framework. The USA, ranked sixth, is the best placed LME, and it has substantially fewer sub-sectors (156 out of a possible 377) in which it has a comparative advantage within the 'non-electrical machinery' sector than Germany (258). Moreover, Australia and Ireland are ranked in the bottom two places in this sector.

The data from the 'electrical machinery' category (columns iii and iv of Table 1) is less straightforward to interpret, as the USA performs significantly better than anticipated within the VoC paradigm. Indeed, although Japan has the greatest number of sub-sectors with a comparative advantage, the USA outperforms major CMEs, such as Germany, Switzerland and Sweden, in an area in which, if the VoC approach is correct, all of the CMEs should be able to gain a comparative advantage over the USA because of their institutional settings. That this is not the case does not, however, vitiate the VoC approach (see below, for a discussion). It should also be noted that the USA is the only LME to perform well in the sector; the UK is, in ninth position, the next highest placed LME.

The evidence from the 'communications equipment and semiconductors' category (columns v and vi of Table 1) poses a challenge to the theoretical predictions of the VoC approach. Although Japan, a CME, tops the Table, the next three positions are occupied by LMEs. Moreover, Germany, one of the major CMEs, performs badly in this

TABLE 1 *Comparative advantage in sectors characterized by incremental innovation, 2002.*

	Non-electrical machinery		**Electrical machinery**		**Communications equipment & semiconductors**	
Country	Rank i	No. sub-sectors ii	Rank iii	No. sub-sectors iv	Rank v	No. sub-sectors vi
Panel A: 'co-ordinated market economies'						
Germany	1	258	3	54	14 =	2
Japan	3	168	1	65	1	15
Switzerland	4	166	4	46	14 =	2
Austria	5	158	6	40	12 =	3
Sweden	7	144	8	35	5 =	6
Denmark	9	123	16 =	13	8 =	4
Finland	12	94	11 =	23	5 =	6
Netherlands	13	65	14 =	15	7	5
Belgium	14	56	16 =	13	12 =	3
Norway	20	32	20	9	21 =	0
Panel B: 'liberal market economies'						
USA	6	156	2	61	2	13
UK	11	99	9	31	3	12
Canada	15	55	22	7	8 =	4
New Zealand	16	36	14 =	15	17 =	1
Australia	21	27	21	8	14 =	2
Ireland	22	20	16 =	13	4	7
Panel C: unclassified countries						
Italy	2	248	7	37	21 =	0
France	8	127	5	44	8 =	4
Spain	10	102	10	27	17 =	1
Portugal	17	35	11 =	23	8 =	4
Greece	18 =	34	16 =	13	17 =	1
Turkey	18 =	34	13	18	17 =	1
Total no. sub-sectors in analysis	—	377	—	126	—	36

Source: OECD International Trade by Commodities Statistics database; own calculations.

area. One explanation of this result, which is discussed below, is that the second stage of the VoC framework, outlined above, overlooks the importance of radical and innovative innovation *within* the same sector.

Success in sectors characterized by radical innovation

Table 2 presents evidence in sectors in which, if the VoC is correct, LMEs should tend to perform better than CMEs; success in these sectors is said to rely on the ability to carry out radical innovations. Columns i and ii of Table 2 show the rank and number of sectors in which the selected OECD countries have a comparative advantage in the 'aerospace' sector. These columns offer strong evidence in support of the VoC approach. Of the four countries with the greatest number of sub-sectors with a comparative advantage in the 'aerospace' sector, three are LMEs and the fourth, France, is unclassified in the VoC literature (Hall and Soskice, 2001b: 19–21). Moreover, Australia, which is ranked in the bottom half (indeed, often the bottom quarter) in the sectors covered by Table 1, moves into the top half in 'aerospace' sector. Furthermore, major CMEs, such as Japan, Sweden and the Netherlands, perform particularly badly in this sector.

Columns iii and iv of Table 2 show the number of sub-sectors within the 'computers' sector in which the selected countries have a comparative advantage. Whilst the USA has the highest number of sub-sectors with a comparative advantage within this sector, the Netherlands (a CME) outperforms all the other LMEs. Japan, another CME, is ranked higher than all but two LMEs. However, it is also worth noting that the UK (ranked third), Ireland and Australia perform significantly better in this sector, which is characterized by radical innovation, than they do in sectors in which incremental innovation plays a greater role. Therefore, the evidence can be seen as supportive of the VoC framework.

Columns v and vi of Table 2 show the rank and number of sub-sectors in which the countries have a comparative advantage in the pharmaceutical industry. The evidence in these columns is, on the whole, consistent with the expectations of the VoC framework. Three LMEs (the UK, the USA and Ireland) outperform all CMEs except Switzerland. Indeed, these three LMEs perform much better than significant CMEs, such as Germany, Sweden and Japan. Although the VoC paradigm would not predict that Switzerland would perform better than CMEs in this sector, the fact that it has the highest number of sub-sectors in the pharmaceutical sector with a comparative advantage does not necessarily contradict the VoC approach (see below).

The data in column viii of Table 2, which shows the number of sub-sectors within the 'scientific instruments' sector in which the selected

TABLE 2 *Comparative advantage in sectors characterized by radical innovation, 2002.*

	Aerospace		**Computers**		**Pharmaceutical**		**Scientific instruments**	
Country	Rank i	No. sub-sectors ii	Rank iii	No. sub-sectors iv	Rank v	No. sub-sectors vi	Rank vii	No. sub-sectors viii
Panel A: 'co-ordinated market economies'								
Germany	5	5	9=	4	8=	16	3	60
Austria	6=	4	15=	1	11	11	11	21
Switzerland	8=	3	12=	3	1	23	2	65
Denmark	11=	1	9=	4	8=	16	10	23
Japan	11=	1	4	10	15=	4	4	52
Sweden	11=	1	6=	6	13	8	9	26
Belgium	16=	0	21=	0	6	19	17=	11
Finland	16=	0	15=	1	21	2	12	19
Netherlands	16=	0	2	15	7	17	8	27
Norway	16=	0	15=	1	17=	3	13=	15
Panel B: 'liberal market economies'								
USA	1	12	1	17	4=	20	1	70
UK	3	7	3	14	2=	22	5	48
Canada	4	6	12=	3	22	1	15	13
Australia	8=	3	6=	6	17=	3	13=	15
Ireland	11=	1	5	9	4=	20	17=	11
New Zealand	11=	1	15=	1	15=	4	21	6
Panel C: unclassified countries								
France	2	10	8	5	2=	22	6	37
Italy	6=	4	9=	4	10	15	7	28
Spain	10	2	14	2	12	9	16	12
Greece	16=	0	15=	1	14	5	20	9
Portugal	16=	0	15=	1	17=	3	19	10
Turkey	16=	0	21=	0	17=	3	22	1
Total no. sub-sectors in analysis	—	13	—	28	—	45	—	126

Source: OECD International Trade by Commodities Statistics database; own calculations.

countries have a comparative advantage, pose a challenge to the theoretical expectations of the VoC approach. To be sure, in the rankings (column vii), the USA performs better than all of the other countries in this sector. However, none of the three countries ranked second to fourth is an LME. Indeed, they are all CMEs. Moreover, the UK is the only other CME ranked in the top half, and it has substantially fewer sub-sectors in which it has a comparative advantage than both Switzerland and Germany.

Discussion and implications for future research

The presence of the USA in sixth place in the 'non-electrical machinery' sector does not vitiate the VoC framework, as most LMEs perform poorly in this sector. As noted above, proponents of the VoC approach would not expect there to be a strict dichotomy between CMEs and LMEs. Similarly, the very low position of Norway in all of the sectors shown in Table 1 does not negate the main contentions of the VoC paradigm. Indeed, given the complex nature of comparative advantage, it would be very surprising to find all CMEs at the top of the Table and all LMEs at the bottom. For instance, Norway is fortunate in that it can export large amounts of valuable oil; this is likely to influence its comparative advantage in other areas. In other words, export success will not just depend upon the national institutional infrastructure, but also on other factors that may be largely unrelated to public policies, such as the exchange rate. To use Boyer's (2003) terms, these may have nothing to do with a country's *virtú* (or its virtues) and everything to do with its *fortuna* (or luck). Therefore, the evidence in columns i and ii in Table 1 supports the VoC framework. Similar arguments may also apply to Australia, Ireland and New Zealand in the 'aerospace' sector, a sector in which, despite the fact that other LMEs do well, these three countries perform badly.

There are two possible explanations for the USA's success in the 'electrical machinery' sector. Firstly, if success in this sector does rely on incremental innovation, it could be the case that the VoC approach downplays the importance of other institutions or resources that firms in the USA may be able to draw upon to pursue successfully strategies of incremental innovation (see below also). Secondly, it could also be the case that the VoC approach overlooks the importance of radical innovation in promoting success in this sector. However, as the USA is the only LME to do well in this sector (Australia and Canada are ranked in the bottom two places, and the UK is ranked ninth behind major CMEs, such as Germany, Switzerland, Austria and Sweden), this suggests that the former explanation may be the more likely.

The latter explanation may, however, be more appropriate in other sectors. Whilst, in a large number of sectors it may be true that *either* radical *or* incremental innovators will be the most successful, it may not hold for others. It may, for instance, be the case that categorizing success in different economic sectors as being reliant on either incremental or radical innovation overlooks the possibility that *both* radical and incremental innovators can succeed within the same market. This would suggest that the second key stage of the VoC approach outlined above downplays the importance of different innovation strategies *within* the same market. This explanation does not, necessarily, call into question the first stage. For example, firms operating in the same product market in LMEs and CMEs may pursue different innovation strategies (radical and incremental innovation, respectively) that are consistent with the expectations of the VoC approach; however, contrary to the VoC model, firms in both countries may succeed internationally as both types of innovators can succeed within that market. Such a process may be at work in the 'computers', and 'scientific instruments' sectors as firms from both LMEs and CMEs can be successful in both of these sectors. In order to assess the importance of such trade within different economic sub-sectors, a more finely grained research design than has been possible here will be needed.

The evidence from the 'computers' sector also raises issues of differences both within national economies and between national economies that are otherwise very similar. Given the broad focus of the VoC paradigm, such differences cannot be given prominence. However, there is some research to suggest that both (sub-)sectoral differences within one country and variation in the same (sub-)sector between countries that are otherwise similar are important. On the former, for instance, Schmidt and Williams (2002) have found that shareholder value has increased in importance in some sectors of the Germany economy (see also Thelen and Kume, 2003); on the latter, there is some evidence to suggest that the production strategies of Finnish and German companies within the same sub-sector are different (Geppert *et al.*, 2003), despite the fact that their national public policies are similar. (See, also, many of the contributions in Yamamura and Streeck, 2003, even if the authors of those papers, whilst paying attention to variation, do not relate it to comparative advantage). Thus, it could be the case that there is substantial public-policy variation between LMEs in this sector or that the effects of public policies within individual economies in this area differ greatly from the norm for that country. By raising such anomalies, this paper has highlighted those areas that may, once again, benefit most from more finely grained research than has been possible here.

The evidence presented on the pharmaceutical industry supports, on the whole, the VoC paradigm, and it also complements sub-sector analysis that is based, predominantly, on qualitative data. For instance, the evidence provided here supports the results of Casper and Matraves (2003) who concluded that British firms were more likely than German ones to succeed in pharmaceutical markets because their (para-)public policy setting favoured radical innovation. However, within this sector, Switzerland, a CME outperforms all other countries in a sector in which an LME would be expected to have the greatest number of sub-sectors with a comparative advantage. As Switzerland is the only CME to do well in this area, it represents an anomaly for the VoC paradigm.

This suggests either that firms in Switzerland are able to draw on other resources that do not play a prominent role in the VoC framework or that they are able to develop what Crouch and Farrell (2002: 7) have termed 'previously unknown capacities' (see also, Streeck, 1992). A closer examination of the pharmaceutical industry in Switzerland is warranted to identify other resources upon which firms can draw in order to succeed in areas that are not, at first glance, favoured by their public-policy setting. In a related field, Casper and Whitley (2004) have suggested that firms in Sweden have been able to draw on resources beyond those identified by the VoC approach to succeed in an area (middleware software) that is not promoted by national public policies. Other anomalies, such as Dutch success in 'computers' and US success in 'electrical machinery', might also be of interest to researchers. The, from the VoC perspective, unexpected success of firms in CMEs in 'scientific instruments' and 'communications equipment and semiconductors' could also be explained by their ability to draw on resources that are not given prominence within the VoC framework.

An alternative interpretation of Swiss success in the pharmaceutical industry might be that companies in Switzerland have been able to use those institutions identified in the VoC paradigm in ways that are not foreseen by that framework. If firms in Switzerland have been able to do this, it represents an important opportunity from which companies in other CMEs can learn. This is important as it represents a chance for companies to improve their performance without having to rely on public-policy reforms, which, because they are highly sensitive politically, may take a long time to occur.

Among the more general features of the two tables it is worth noting that in line with VoC expectations, Japan is placed higher in all sectors characterized by incremental innovation than it is in those marked by radical innovation. This is also true with the exception of 'computers', for Sweden. Similarly, Ireland, with the exception of 'communications equipment and semiconductors' and 'scientific instruments', performs

better in sectors characterized by radical innovation than in those in which incremental innovation plays a greater role. Indeed, with the exception of 'communications equipment and semiconductors', the UK also performs better in areas marked by radical innovation than in those sectors in which incremental innovation is more important. Even the USA, which also performs well in sectors characterized by incremental innovation, does better in those sectors in which radical innovation plays a greater role (with the exception of the 'pharmaceutical' sector).

Conclusion

By adopting a quantitative and, in comparison to many other VoC studies in this area, broader approach, this article has shed new light on the possible link between public policies and comparative advantage. Overall, the findings are in line with the expectations of the VoC framework. In many important economic sectors, national public policies can influence patterns of competitive advantage.

What does this imply for public policy? The results here suggest that calls to deregulate economies underestimate the advantages that non-market institutions can confer on companies in economic sectors that are characterized by incremental innovation. In other words, critics of more highly regulated public policies (Schiltz, 2004; Siebert, 2002) have tended to adopt a one-sided view of these policies, as they have overlooked the potential benefits that these policies can confer on private-sector organizations. Such benefits can include the acquisition by workers of firm-specific skills; these skills are, in turn, an important necessity in certain product markets.

Critics of highly regulated public policies may counter that in sectors such as aerospace and pharmaceutical products such policies do not appear to offer advantages to firms, and that public policies should, therefore, be reformed along neo-liberal lines. This may, however, represent a simplistic reading of the data. As noted above, there are firms in CMEs that perform well in sectors characterized by radical innovation. This suggests that such firms may have been able to develop 'previously unknown' capabilities that enable them to overcome the co-ordination problems associated with such innovation strategies. If they have been able to do this, they have done so despite the fact that their public-policy setting does not promote innovation strategies based on radical innovation. Alternatively, firms in CMEs that perform well in sectors characterized by radical innovation may have been able to draw upon other resources beyond those identified in the VoC framework.

Regardless of which interpretation is the more accurate, such anomalies represent important examples from which firms in other

CMEs can learn. Therefore, it may be more appropriate – and politically feasible – for governments in CMEs to promote such learning rather than to undertake extensive public-policy reforms that may well jeopardize firms' strengths in other areas. In other words, the strength of many CMEs in sectors that are based on incremental innovation suggests that governments cannot undertake wholesale public-policy reforms as such reforms are likely to undermine those strengths. It would appear to be better for governments in CMEs to learn from the practices of those CMEs that are able to achieve success not only in sectors characterized by incremental innovation, but also in those sectors that are marked by radical innovation. (The same arguments apply, *mutatis mutandis*, to those firms in LMEs that perform well in markets characterized by incremental innovation.)

When considering any potential public-policy reforms, governments will also have to pay attention to the significance of the different forms of innovation to the country's economic success in terms of, for example, national income, jobs, economic growth, and welfare. In other words, is it better (however the term is defined) to be more successful in incremental or radical innovation? Relatedly, research into the development of the importance of sectors characterized by incremental and radical innovation over time should also be conducted to determine whether radical innovation is losing or gaining in importance, and thus whether in the future it will be better to have public policies that promote incremental or radical innovation. At present, this aspect of the debate is missing.

NOTES

1. The authors would like to thank Orfeo Fioretos for his help in clarifying the OECD's classification system used in this paper. We are also indebted to three anonymous reviewers for their helpful comments and suggestions.
2. A list of the sub-sectors included within each category is available from the corresponding author on request.

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